VOL. III #4 DEC. 1987 PRICE $3.50

EXPERIMENTAL MUSICAL INSTRUMENTS

FOR THE DESIGN, CONSTRUCTION AND ENJOYMENT OF NEW SOUND SOURCES

YOU TAKE A STICK OF BAMBOO

The two lead articles appearing in this issue of EMI both take up where industrial technology leaves off. The first is David Courtney's account of the creation of a unique violin-like instrument by Nageshwar Rao, a rural Indian builder working without access to special tools or materials. The cultural context that emerges in the article is as interesting as the instrument itself, as Mr. Courtney elucidates differences in approach between Western builders and this man of traditional India. They appear in techniques and materials of course, but differences also arise in an underlying sense of what an instrument is and is for, and in the role of innovation in the relationship of the individual to a larger tradition.

IN THIS ISSUE

The second focus in this issue happens to be on one of the materials used by Nageshwar Rao to create his instrument: bamboo. Our discussion of bamboo in instrument building comes in two parts. One is an overview of bamboo, some of its musical properties and some of the ways it has been used in instruments in the past. Then comes the heart of the matter in an article by Darrell DeVore, a builder who has done extensive creative work in bamboo. He describes a special relationship with bamboo, and how the magic of the material has come out in instruments he has built.

Nageshwar Rao's Kamakshi Vina may be found starting on page 5; bamboo on page 10.

COVER ART: The ink brush painting that borders this page was made by Richard Waters.

R.W.

Dear Sir/Madam:

I HAVE BEEN ATTEMPTING A FLUTE BUILDING PROJECT using just intonation as well as other tunings, but I am frustrated in setting exact pitches.

Is there anyone with the appropriate formulas for determining hole positioning, using various diameters and lengths of tubing? 5, 7 and 9 hole positions are needed, but I am most interested in 6-hole pennywhistle fingering.

Perhaps there is already a computer program or chart available which does the job, but where?

I am surprised at never hearing mention of people working in the area of steel pan. Exact dimensions, concept, and tuning technique have changed greatly since Pete Seeger's book of 1961 (the only book on the subject that I am aware of). Are there any current technical materials available?

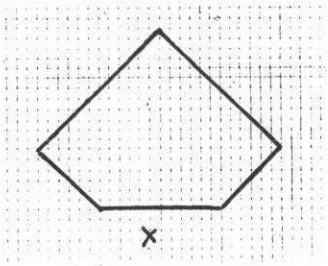
Resources are rather scarce out here on the border, so whatever help you can give will be appreciated and used.

Great newsletter and keep up the good work.

Mitchell Druckman
310 Briggs Ave.
Bisbee, AZ 85603

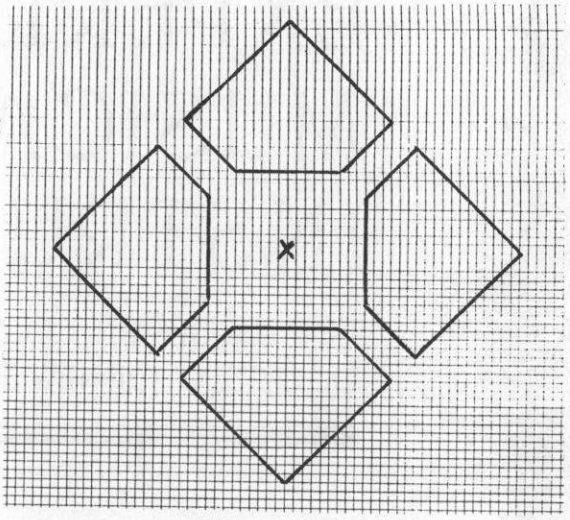
I ENJOYED READING BOB PHILLIPS' ARTICLE on modularity in Volume III #2. And it struck me that most of the instruments I have been making are modular by virtue of their symmetrical geometric shapes. For example, the Bug (see ad this issue) is a diamond shaped instrument (fig. 1). After reading Bob's article, I began to realize some of the modular possibilities of multiple bugs, both for a single player, and for several players.

Figure 1



Using four Bugs facing outward in four directions from a center point (Fig. 2), a single player has easy and immediate access to any instrument or combination of instruments. Inverting that arrangement, that is, pointing the instruments toward one another (fig. 3), the four Bugs can accommodate four, or as many as eight, players. Of course, more than four instruments could be combined in various arrangements to make larger ensembles. And these would be integrated visually and ergonomically, by virtue of their symmetrical geometric shape, to allow their maximum utilization.

Figure 2



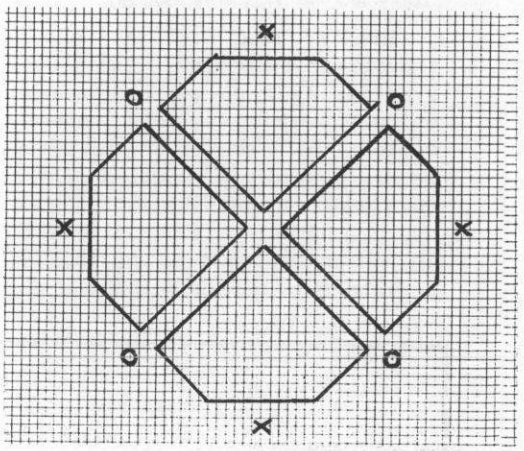


Figure 3

On the other hand, a solo player's orientation to the arrangement of multiple instruments may be based on the various devices rather than on the individual instruments. For example, considering the arrangement in Figure 2, the strings of all four instruments might be played as a single stringed instrument, the rods as another instrument, the nails as a third instrument, etc. This approach is bound to yield new material and playing techniques not really possible with a single instrument.

I hope other designers/builders will likewise benefit by considering the principle of modularity in the design or arrangements of their instruments.

Tom Nunn

GREETINGS **

Just a little updating: John Chalmers stopped in on his way to Berkeley from Houston TX -- left me a tape that deserves a little comment.

It was a Kurzweil demo -- now among the high-end synthesizers, such as the fabulously expensive Fairlight and Synclavier. They do not seem to have quite the 19th-century-style autocratic ATTITUDE that the Kurzweil advertising and publicity (magazine articles beginning a few years ago) have. It's a matter of "Design Philosophy," as engineering buzzwords put it. The Kurzweil goal is merely getting an 1870 concert grand imitated as closely as possible. Well they almost do, but by the same token, teenyweeny failures to do it Perfectly show up more than they would in the case of some manufacturer with a different, less nasty-autocratic, attitude. It magnifies or exaggerates or amplifies my skeptical critical mean attitude when listening to it -- I turn into a terrible horrid nitpicker. For instance, some bass notes on the piano-simulacrum stick out as definitely not the Real McCoy. I bet they would pass for normal in another context. But somehow they do not fit in with the tenor and treble notes on that part of the tape.

I could take malicious glee in the fact that their attempt to imitate a jazz group falls short. Attitude again! Why did they dare to? They could have been prudent and avoided that confrontation.

The cultural dissonance consists in their using the latest technology, hiring the best team of researchers they can buy, and limiting the very latest engineering and electronic design to the

(continued next page)

CORRECTION

In the "Recent Articles in Other Periodicals" section in EMI's last issue (Vol. III #3) EMI failed to credit the author of the article from **American Lutherie** called "The Hammered Dulcimer: Ancient, Wonderful and Still Evolving." The author of the article is Sam Rizzetta. Apologies to Sam and to AL for the oversight.

EXPERIMENTAL MUSICAL INSTRUMENTS
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EMI BACK ISSUES AVAILABLE

The original press runs for the first nine issues of **Experimental Musical Instruments** -- that's Volume I #1-6 and Volume II #1-3 -- have sold out. With requests for those issues still coming in, the publisher has had to go through a cost assessment to decide whether we can afford to reprint them. In spite of various attempts to twist the numbers around, we've had to reach a negative conclusion. So those of you who have those issues in their original form can claim to have priceless collectors items in hand, and may congratulate yourselves.

News Flash! Stock Prices for Xerox Corp. Soar!

Those issues remain available, however, in photocopy. The copy quality is reasonably good, and they come in a protective cover. The photocopy back issues will be sold at a reduced rate of $2.50 each. Volume sets containing photocopied issues will be $14 each. (All the issues in the Volume I set -- that is, Vol. I #1-6 -- are in photocopy. Half of those in the Volume II set are.) Anyone who happens to send the full price for orders of these reduced price issues and sets will receive either a refund or an extension of their subscription, depending on what is convenient and appropriate in the situation. Before the reduced prices outlined here were formulated, some people paid full price for photocopied back issues; those people may choose to write requesting a refund of the difference.

Making the sold-out back issues available in photocopy is not a cheap way out -- in fact, it is both expensive (between the copying, the cover, the larger envelope requirements and increased postage costs) and a lot of work. The effort seems justified, however, if EMI is to fulfill its purpose of bringing the world of new instruments to everyone who is interested.

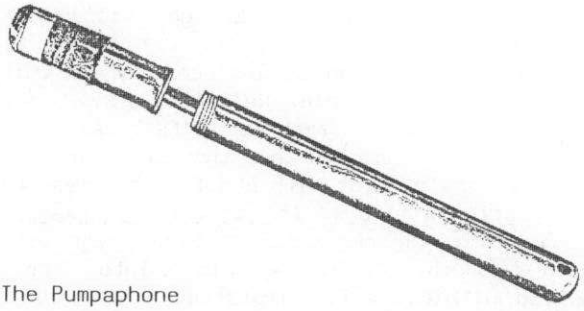
Meanwhile, Volume II #4 and subsequent issues remain available in the original press run and at the regular price of $3.50 each.

copying of Central Europe as it was about 150 years AGO and by this design philosophy preventing progress in music itself and not serving today's composers.

I don't have to belabor it further -- I merely have to tell you about it so that you will see how useful you are, helping us in the network of people to progress in spite of such perfectionist authoritarians.

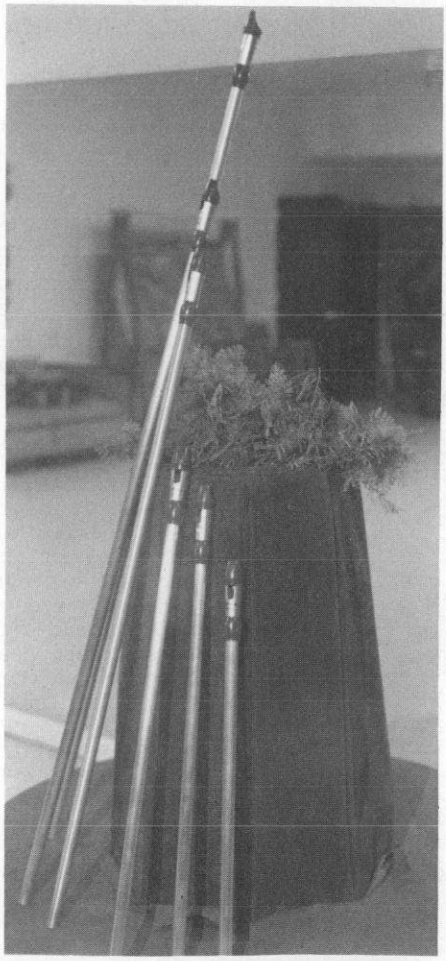
Ivor Darreg

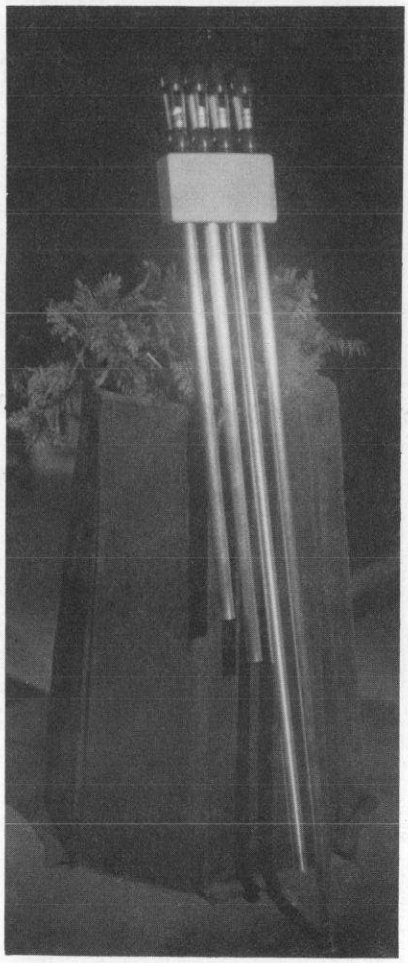
From the editor: Two issues ago we ran an article, written by myself, in praise of slide whistles. Bob Phillips responded to it in time for the next issue by sending along a fully operational slide whistle in an unexpected form: what would appear to most people to be a large plastic hospital syringe revealed itself to have a continuous range of something less than two octaves when blown over the top. Now we have another dual-identity whistle, discovered by French instrument explorer, Jacques Dudon. Mild mannered reporter Clark Kent, in this case, is a bicycle pump. With a blowhole drilled in the side near the end opposite the handle, it becomes a slide flute with an adequate seal, a smooth and easy action, and a range of about an octave and a fifth. Alternatively, the original endhole (through which the pump originally expelled air) can be used as a blowhole, though in size and shape it is not as well suited as a specially drilled sidehole.



The Pumpaphone

FIPPLE PIPES: In EMI Vol. II #5, Feb. 1987, there appeared an article by Denny Genovese on his Fipple Pipes -- long pipes with recorder-style mouthpieces and without toneholes, capable of producing the tones of an extended harmonic series by changes in wind pressure. At the time of the article we were unable to get photographs of the instruments, but these fine photographs have since become available. On the left are individual Fipple Pipes in several keys; at right a tuned set of four mounted for a single player.





THE PYROPHONE EXPLAINED

I HEARD ABOUT THE PYROPHONE in William Bragg's **World of Sound** (Dover, 1920; 2nd ed. 1968), in which he refers to it as the "singing flame."

A gas flame is inserted a few inches into the bottom of an open-ended vertical pipe. As it is the air column which is set into vibration, it doesn't matter if the pipe is metal or glass (cardboard would not be such a great idea, however). Seconds after the flame is inserted, a loud, steady tone begins to sound and continues as long as the flame is held in position.

What is happening? I tried it with a 5-foot pipe and got the fundamental of an open pipe of that length (slightly higher, actually, which I attribute to the higher speed of sound in the pipe's heated air). The thing to keep in mind here is resonance.

By applying just a tiny bit of force at exactly the right time, one can keep a swing swinging or water sloshing in a bathtub. The same principle is at work inside the pipe.

In the case of the fundamental mode of vibration in a flute or fipple pipe, a compressive force from an airstream causes a compression in the air column which travels down to the end of the pipe. There, it is partially reflected back up the pipe to arrive at the mouthpiece just as the next compressive force is applied, whereupon the process is repeated.

Meanwhile, the airstream, having caused this compression of air, suddenly finds that the air pressure outside is less. This forces the stream to flip across the fipple or blowhole edge and flow outside. By the time the compression has reached the other end of the pipe, a rarefaction (low pressure area) has formed behind it. This forces the airstream to flip back in again where it meets and reinforces the reflected compression.

In this way, a standing wave is formed inside the pipe -- a wave whose frequency is determined by the length of the air column. One of the cycles described above causes one vibration in the surrounding air. So a pitch of A-440 is caused by this cycle happening 440 times per second.

But let me digress for a moment back to the original subject.

The pyrophone works in the manner described above except that the force doing the pushing is not compressive but **expansive.** Air expands when it is heated, causing slightly less oxygen to be available for combustion. The rarefaction resulting from the expanded air travels to the end of the pipe and is partially reflected back. Meanwhile, the slightly smaller flame allows some comparatively cooler air to enter and feed the flame in time to reinforce the reflected expansion.

Your article on the Baschet brothers was excellent, by the way. A wonderful overview of the development and diversification of one idea into many. Keep it up!

Michael Meadows

INSTRUMENTS

TATA AND HIS **KAMAKSHI VEENA**

by David Courtney

INTRODUCTION

Experimentation in the construction of new musical instruments is a fundamental aspect of human culture. Wherever there is man, there will be those who strive to create new music with new musical instruments. Previous articles in this journal have tended to concentrate on western man's experimentation, with particular emphasis on work presently underway on the west coast. It will be very interesting to show the work of one maker who is far removed both culturally as well as geographically from the west coast. This article will deal with the work of an East Indian who is known as **Tata,** and his **Kamakshi Veena.**

PREFACE

The subject of experimentation in the evolution of musical instruments is complex. Concentration on the mere technical aspects of new instruments is certainly interesting but incomplete. It is incomplete because the development of new instruments should be considered along with the cultural environment in which they develop. The cultural environment is important because: 1) it subtly lays down a general direction for experimentation

KAMAKSHI VINA & BOW

and 2) it determines whether the new instrument will be amalgamated into the total musical/cultural environment.

The western approach is largely Aquarian in its outlook. The artists and craftsmen who fashion new musical instruments tend to do so from a sincere desire to transcend their present musical environment. The instruments themselves tend to be a social statement.

The Indian environment for experimentation is largely economic in its motivation. We see (especially at the village level) that musicians tend to make their own musical instruments because the commercially available ones are cost prohibitive. Most Indian musical instruments cost several hundred rupees (approximately twenty dollars) and extend into the thousands (a few hundred dollars). This to us may seem very inexpensive but to an Indian villager it might represent several months' earnings. Making one's own instrument therefore becomes a matter of necessity. The availability of materials then enters the picture as a significant factor in the development of instruments. In general, the villager experimenting with new musical instruments is not making a "statement" but merely making variations upon established themes to be readily absorbed into the larger fabric of Indian culture.

The diversity of Indian culture has not been surpassed by any country in the world. Its native populations are derived from two different bloodlines (Caucasian, Australoid). It has over a dozen languages with over 800 dialects. The religions are mixtures of Hindu, Islam, Sikh, as well as Christian, Buddhist, and variations on tribal animism too numerous to mention. The economic disparities are equally varied. Many of the industrial families have combined wealth that is comparable to the Rockefellers. At the same time there are villagers whose annual earnings may be less than $20. The musical environment is composed of two major classical schools and hundreds of regional styles.

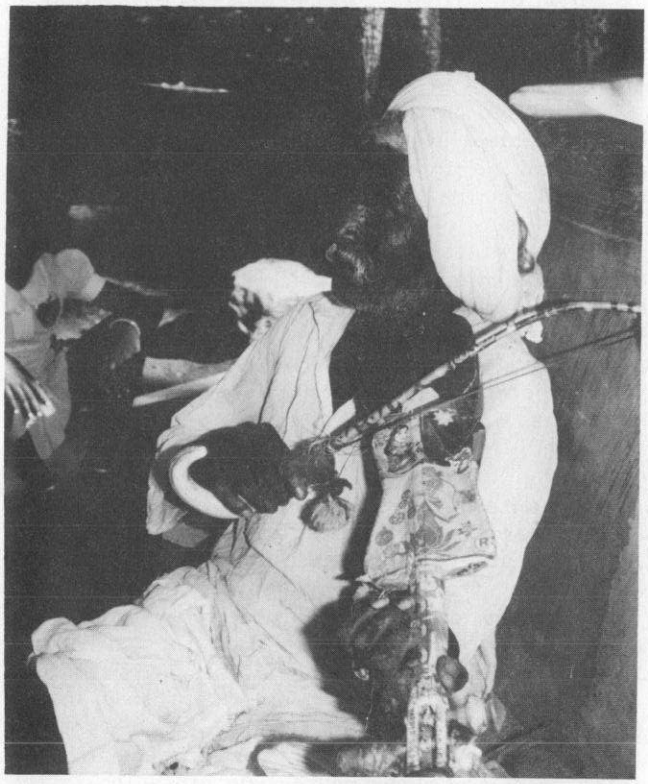
It is this diverse musical heritage that interests us greatly. It would be impossible for us to fully explore the entire topic of the continuing evolution of Indian instruments, so we will concentrate on one man.

TATA AND HIS KAMAKSHI VEENA

It was about January 1980 when communal violence interrupted my studies in the Southern city of Hyderabad. It seemed a reasonable time to visit some of my in-laws, so my wife and I hastily made travel arrangements and departed for Akiwidu. Akiwidu (pronounced Ah-Ke-We-Do) is a very small town (hardly more than a village) whose only points of interest are its train station and its missionary hospital. It is located in coastal Andhara just a few hours by train from Vijaywada. The usual round of eat/sleep/gossip quickly got boring so I decided to see if anything musical was going on.

I had been attracted to a strange musical instrument that I had seen being played. I had studied Indian music all of my adult life and had spent years in India, but this was something new to me. It was a bowed instrument similar to a violin but had features in its construction which differed from anything I had seen before. So I decided to find out more about it.

I was informed that there was a wandering minstrel who made these and sold them at fairs and sometimes in the local bazaar. Nobody knew much about him. They just knew he was an elderly villager whom everyone affectionately called "Tata." Tata is the Telegu word for grandfather. The feelings of community are so strong in India that it is very common to hear people being referred to as Father, Mother, Sister, etc., who are of no apparent relationship.



THE MAKER PLAYS

Inquiries were made as to his whereabouts. It was an easy job to find out where he lived because Akiwidu is such a small place. A boy was fetched and sent to see if Tata could be persuaded to show me how to make his Kamakshi Veena. A short time later the boy returned to say that Tata did not want to come. I then resolved to go and see him.

The lane leading to Tata's dwelling was like so many I had seen in India: very narrow and unpaved, with vastly different levels of building construction existing together. One could see the so called **paka** house made of cement and stone and adjacent to it would be a **jhompadi** which might be nothing more than a grass mat covering some bamboo. Typical for all the houses would be a section on the ground in front of the door which is carefully coated with cow dung. On top of the dung are white patterns drawn with a mixture of chalk dust and rice flour. This **mugu** or **rangoli**

is almost a morning ritual and is considered a symbol of the cleanliness and propriety of the householder.

It was a little difficult to find Tata's house. The main problem was communication. I was used to moving about freely in Hyderbad. It was a large city and its local language was a dialect of Urdu in which I had become comfortable. Akiwidu, on the other hand, was purely a Telegu area, a language of which I could understand only a little and speak none. This problem was solved through one of the inhabitants who spoke Urdu as his mother tongue. I was thus able to use him as my interpreter, though one can imagine the mental gyrations one must go through to first formulate ideas and mentally translate them into Urdu, and then have another person interpret them and translate them into Telegu.

We found the house where Tata lived. It was a low broad structure with mud walls and a thatched roof supported by bamboo and logs. Traces of whitewash still remained on the walls outside. Tata did not seem surprised that I had come but he did not want to see me and was visibly afraid of my presence. It seems that he had got the idea from the boy that I wanted to take him away with me to America, and he didn't want to go. His attitude changed when he found out that I was not going to take him from his home and family and that I just wanted him to show me how he made his instrument. I made it quite clear that I would pay him for his help. He agreed to come the next day to my house.

The next day he arrived and was very cheerful and proud that a **Dora** (white man) had taken interest in his work. Through the rest of that day I learned that he must have been in his late 60s (he himself did not really know how old he was). His real name was Nageshwar Rao, and he was married and had grown children. Telegu was the only language he spoke and his cast was **Adi Andhara** (scheduled class, what used to be called "untouchable").

He brought with him a bag, out of which he proceeded to pull his materials and tools. These materials included sticks, horse hair, membrane covered bowls, bamboo, resin, colored paper, and string. The tools were also very crude by the standards of western craftsmen.

He explained that he was going to show me how to make a Kamakshi Veena. The word **Kamakshi** is derived from a goddess of the same name and the connection is obviously in reference to the narrow waist which both the statue and the musical instrument have. The word Veena is a generic term which can be applied to any and all stringed instruments.

Kamakshi Veena is essentially a piece of bamboo of about two feet in length which is made of three sections (two nodes as the shafts at both ends). The bamboo is cut about four inches above one node and about ten inches below the other node. The ten inch section is cut longways and carved to make a spike. This spike will pass through the resonator. The four inch section has four holes burned into it for the two tuning pegs (see the diagram).

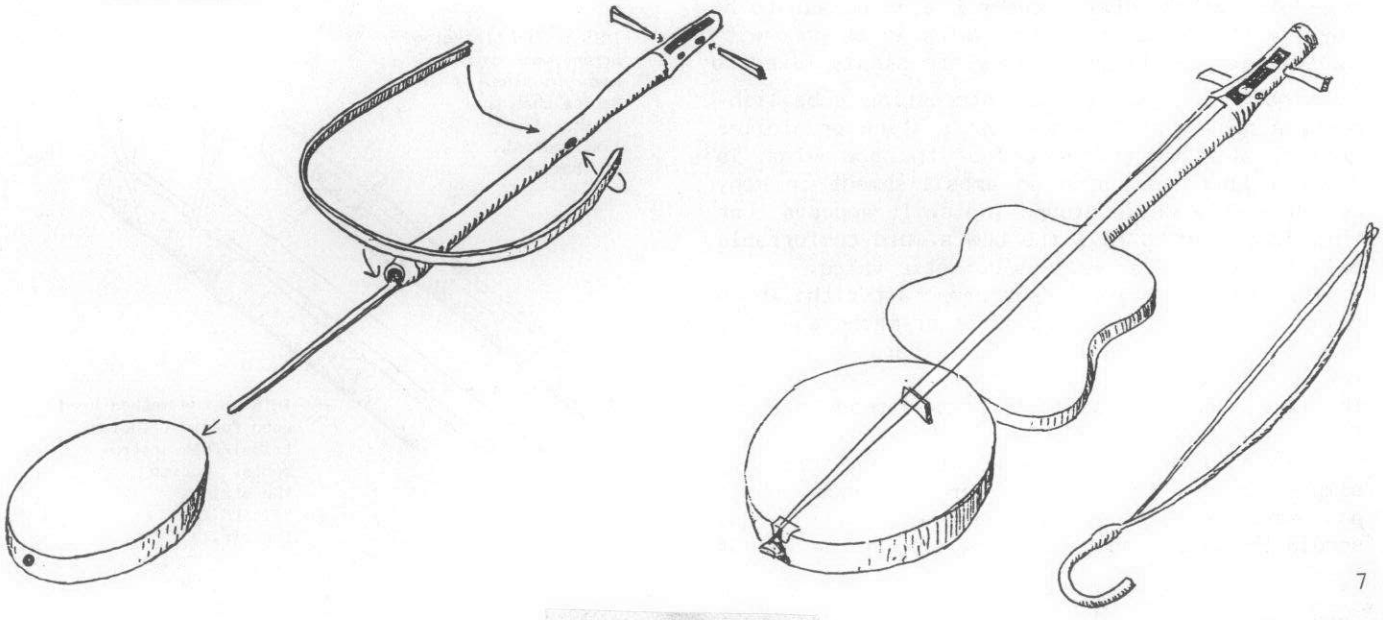
The heart of the instrument is a bowl or container which has skin or membrane stretched over its face. The method of attachment varies but in the case of this instrument, it appears that a membrane (peritoneum) was simply stretched over the face very soon after the animal was slaughtered. Although Tata did not show me this part, my previous work with tablamakers in Hyderabad leads me to believe that fresh peritoneum is so glutinous that it does not have to be glued. The bowl has two holes in it. These holes are so that the bamboo neck can pass through.

The bamboo neck is then cut and holes are made by taking a hot iron rod and burning the holes in. (I can tell you from personal experience that holes which are burned are less likely to split at a later date than holes which are drilled.)

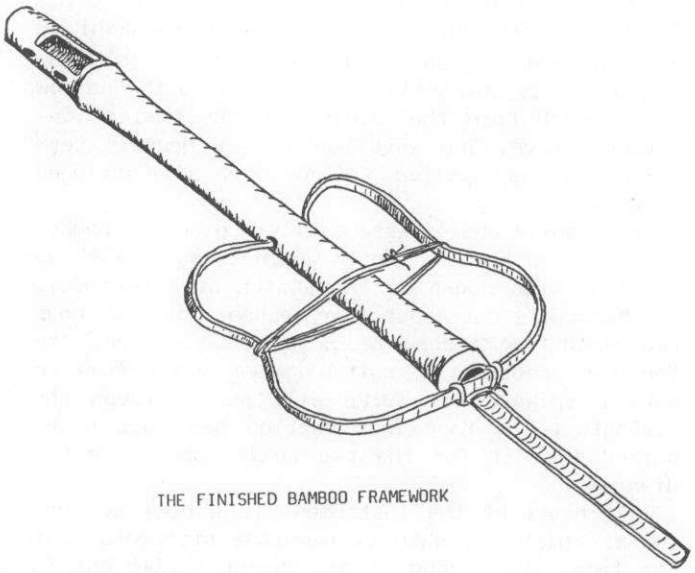
A strong strip of bamboo of about one centi-

THE STRUCTURAL ELEMENTS
ON THE LEFT...

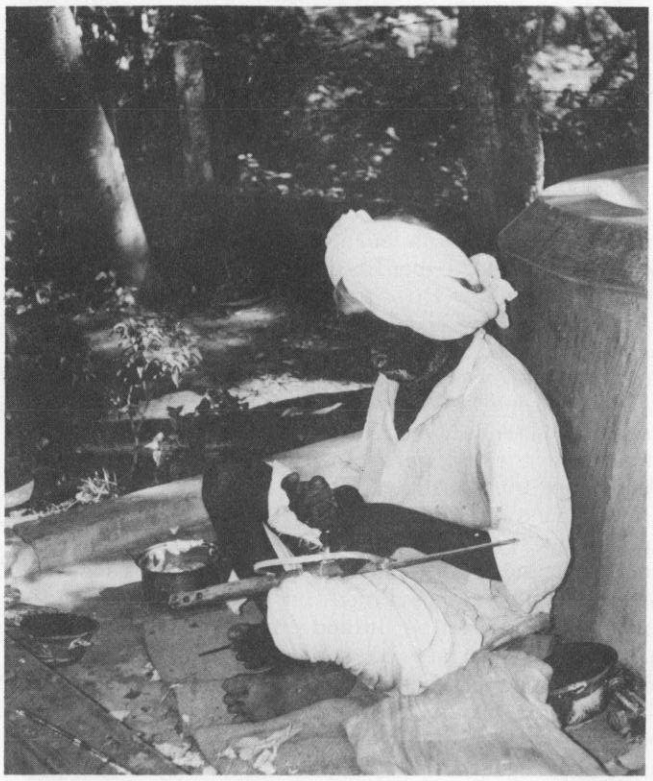
...COME TOGETHER TO CREATE
THE BASIC FORM AT RIGHT.



meter in width and forty-five in length is then bound firmly at its midpoint to the base of the spike with string. It is then bent and lashed with more string in the middle. The other ends are bent and passed into holes on the side of the bamboo. The whole thing is now glued.



THE FINISHED BAMBOO FRAMEWORK



TATA AT WORK

Cardboard pieces are now cut and placed in the open area. The entire center section is now built up with papier-mache. Thereafter, a very thin layer of colored paper is applied to the bamboo. The whole is now allowed to dry.

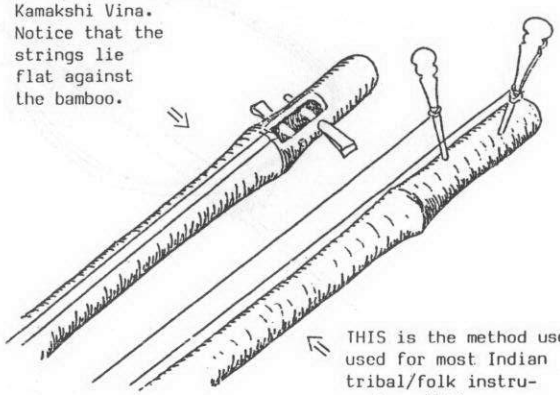
The tuning pegs can be made while it is drying. A small section of large diameter bamboo is taken and whittled to the shape shown in the diagram. One might also mention that there is no effort to remove the outer "skin" of the bamboo. On a previous occasion while I was studying under a veena maker, I was told that the outer layer of bamboo, though very thin, is the strongest part of the plant.

We can also build the Kaman or bow while the glue is drying. The bow is of incredibly simple construction. Horse hair is simply fixed at both ends of a stick. There does not even appear to be any effort to alternate the hairs as is done with violin bows in the west. They are simply fixed as is. There is however one interesting embellishment. A curved article such as a stick or similar item is attached to the end of the bow which is held. I have seen such an embellishment on many bows for folk music around India. It appears that this functions to give the bow a more comfortable balance and feel as well as cosmetic value.

The final assembly is performed after the whole thing has dried. The bamboo/papier-mache assembly is inserted into the resonator. There is no need to glue or otherwise bind this assembly because the holes were cut so that it is already a tight fit.

The strings are attached in an incredibly simple manner. Both strings are of equal gauge and have loops made on one end. These loops should be large enough to pass around the end of the spike of bamboo protruding from the end of the resonator. They then pass along the upper surface of the resonator, over the neck and down into the open space where the tuning pegs are. The strings are simply tied to the pegs. This itself is interesting because Tata has no way of drilling holes small enough to allow a string to pass, since he does not own a drill. The strings are now tightened, but as they are tightened a small piece of cardboard is jammed in between the string and the rim of the resonator to protect the skin. Otherwise the string would cut into the membrane at that point, creating a weak spot which would

THIS is the stringing arrangement on the Kamakshi Vina. Notice that the strings lie flat against the bamboo.



THIS is the method used used for most Indian tribal/folk instruments. Notice the strings "float" in the air.

ultimately tear. Also, during this tightening process a small square coin, or a piece of coconut shell or a piece of plastic, or just about anything, is inserted between the string and the membrane. This functions as the bridge.

The tightening of the strings proceeds until they reach the correct pitch. The tuning is not critical from the standpoint of key or interval. Since this instrument is intended to be used as an accompaniment to the voice, it will be tuned to match the key of the singer. The interval between the strings may vary, but Tata seemed to prefer a tuning which corresponded to the tonic for the innermost string and a minor third down for the second.

The Kamakshi Veena is now finished.

COMMENTARY

The question of what this instrument is can be quite a question indeed. When Tata himself was asked about it, he indicated that what he was doing was making a violin. (Indeed a few people have attempted to call violin kamakshi veena, though this is admittedly quite rare.) Our first impression of such a statement is of course astonishment, but it is equally astonishing to Indians to find sitar being called "lute." It is a basic human process to take something new and strange and translate it into something familiar.

This process of translating the unfamiliar into the familiar is exactly what Tata did with his instrument. He saw a violin, which is common in southern India but rare in his community, and fused elements of its construction with indigenous folk instruments along with some embellishments of his own.

The folk influences from which Tata drew as a base are readily apparent, especially in the membrane covered resonator. This type of resonator is a very common element of Indian stringed instruments. The only western instrument of the class would be the banjo (of African origin). Apparently there are no such bowed instruments in the west. For anyone who has never heard such an instrument, it is impossible to describe the richness of the tone.

Another element which is definitely of Indian origin is the extensive use of bamboo. Westerners tend not to realize the desirable properties that bamboo has. In a nutshell, we could say that it is cheap, replenishable, surprisingly consistent (within each strain), and more importantly, has a strength/weight ratio which is unsurpassed by any of the woods western civilization uses.

Tata's Kamakshi Veena has certain elements of the violin in its construction which stand out from its Indian elements. The most important of these is the manner in which the strings attach at the tuning pegs. Most Indian folk instruments have just a single bridge at the resonator. This makes it necessary that the tuning pegs stand up vertically, serving to hold the strings up at the end opposite the bridge. The strings in a sense just float above the neck. The Kamakshi Veena, in contrast, shows some western influence (or perhaps influence from the more developed instruments like **Saraswati Veena**), in that the strings pass over a second very small bridge at the end of the fingerboard and down from there to attach to tuning pegs. These pegs, in contrast, have a horizontal orientation. Of course, this second bridge is nothing more than the node of the bamboo.

Another element is the shape of the papier-mache assembly. Tata himself declared that it was there for the sound, but by looking at its construction it obviously doesn't function as a resonator like we see in a violin. However, that is not to say that it doesn't influence the sound. Even a cursory glance at the structure of bamboo makes it evident that bamboo makes a very good natural Helmholz resonator. This resonator would tend to give a coloration to the sound of the instrument. The act of burning a hole into the side and padding with glue, string and papier-mache would certainly dampen these natural resonances. My own personal feeling, though, is that the influences of the bamboo as compared to other factors would be negligible anyway. Never the less, we should be open to the possibility that this dampening could be a significant influence.

There are a number of innovations in the Kamakshi Veena which are neither western nor traditionally Indian in nature. These appear to have sprung spontaneously from Tata's own creativity.

I feel that the most important innovation is the use of peritoneum for the resonator. Most Indian instruments that use membranes use the dermis, usually goatskin, but on occasion I have seen buffalo, or even snake or lizard (on the **kanjira**, a southern Indian tambourine, for example). I have encountered the use of this type of internal membrane only once before, and that was on an obscure south Indian drum called **Uddaku**. The characteristics of the skin are very important in determining the final tonal quality of the instrument. The general thinness of the peritoneum, coupled with the its high tension when it is mounted on the instrument, would tend to yield a sound rich in overtones, especially compared to a resonator made of derma.

More evidence of Tata's creativity is seen in the fact that all of his instruments are different. Variation is especially evident in his choice of resonators. I have seen tin cans, serving bowls and a variety of other containers utilized for his instruments. All of them were probably chosen with availability as an important consideration.

It is doubtful that Tata's contributions to Indian folk music will ever receive any more attention than this one article. It is most likely that his innovations will quietly be absorbed into the fabric of Andhra Pradesh's village culture as a natural part of the evolution of Indian instruments. But we can get a perspective on our own musical evolution by noticing the parallels between Tata's world and ours.

BAMBOO

Introductory article by Bart Hopkin, with information, suggestions & inspiration from Richard Waters, Tony Pizzo, Darrell Devore, Tony Tammer & others.

Recently Experimental Musical Instruments ran a set of articles on instruments made with gourds, a wonderfully varied, colorful and versatile resource. Now we look to another, equally important natural material; one which has been invaluable to instrument builders in many, many cultures over the years: bamboo. We'll first take a general look at bamboo as an instrument builder's resource. Following that we'll hear from one extraordinary builder, Darrell DeVore, who has made a specialty of varied and inventive uses of bamboo.

ONE IMMEDIATELY THINKS OF FLUTES -- shakuhachi, ney, and similar instruments existing in many other cultural environs. But bamboo can be and has been used in a thousand musical ways. There are bamboo instruments in all major categories except electrophones. Among them are many surprising, delightful and unexpected forms. The possibilities in bamboo apparently are limited only by the imaginations of the people who choose to work with it.

As a growing plant, bamboo has sometimes suffered from a bad reputation in this part of the world. It has been regarded as a rampant spreader, and a pest. The reputation is not well founded: there are a huge number of varieties of bamboo, and they are of widely varying growth habit. Some can be hard to control; others need constant encouragement; the majority may fall somewhere between. Some may be scruffy if ill-attended, but between the delicate pygmy bamboos and the giant timber bamboos are some truly lovely, grand and graceful species. The wood of many bamboos is of such a quality that it would certainly have a place alongside the products of the domestic lumber industry, just as it does in other parts of the world, if only our economy were to make room for it.

Bamboo lends itself especially well to instrument making primarily for two of its characteristics -- its form and the quality of the wood. The tubular shape makes it ideal for all sorts of purposes involving air columns, and the presence of the nodes at intervals makes the stopping of the tube where needed natural and easy, while they can just as well be removed if need be. The personality of the wood varies from species to species, but at its musical best it is hard and springy, making for reflective walls for air columns, or producing a sharp bright sound when used idiophonically. Its high strength/weight ratio makes it excellent for string instrument necks and other structural functions. The fibrous quality is valuable in still other musical applications.

One of the keys to taking advantage of these qualities is finding an appropriate variety of bamboo for the intended application. Richard Waters, known to readers of EMI as the inventor of the Waterphone, is an experienced bamboo person, growing about seventy varieties currently himself. He has provided the following list of bamboos known for the quality of their wood. He includes the height and diameter of mature plants, along with an indication of cold-tolerance and desired sun exposure. (Cold tolerance is represented by the degrees Fahrenheit below which damage is likely to occur, and sun exposure by a number from 1-5: 1 indicates full shade is best; 5 indicates full sun.)

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Recommended Bamboo Species

All species of the Phyllostachys family are fine wood bamboos. They are generally large, moderately hardy, and sun-loving. Especially good are:

Species	Hght	Dia	Deg	Sun
P. viridi-glavescens	35'	2"	0°	5
P. rubromarginata	32'	1¼"	0°	5
P. viridus	47'	3¼"	-5°	5
P. pubescens, "Moso"	75'	7"	0°	5
P. meyeri	33'	2"	0°	5
P. bambusoides	72'	6"	0°	5

Some smaller bamboos with good wood, from the Arundinaria family:

A. amabalis	40'	2"	15°	5
A. simonii	20	1½'	0°	4

Generally speaking, members of the Bambusa family are neither as strong and durable nor as cold hardy as other families.

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The best source for current information on bamboo is the American Bamboo Society. It produces a regular newsletter and a journal. Its publications include articles on all aspects of bamboo cultivation and use, including descriptive listings of the huge number of varieties and source listings for obtaining them. Membership in the society is $15/year, from the American Bamboo Society, 1101 San Leon Ct., Solana Beach, CA 92075. Membership is available in separate localized chapters of the society as well.

For people interested in bamboo flutes, there is the British Shakuhachi Society, which produces a quarterly newsletter. Membership application forms may be obtained by sending a stamped, self-addressed envelope to The British Shakuhachi Society, 15 Granidson Road, London SW11 6LS, England.

Additionally, Richard Waters will be happy to answer in writing questions about bamboo sent to him at 1462 Darby Rd., Sebastopol, CA 95472.

A LISTING OF TRADITIONAL MUSICAL INSTRUMENTS MADE FROM BAMBOO

(There are, of course, many more musical uses of bamboo than what appears here, but this sampling will serve to highlight major types, and point to the great variety of further possibilities.)

Boobams. Boobams are sets of tuned drums, with membranes stretched over long, narrow, tuned tubular bodies. The bodies originally were, and usually still are, large diameter bamboo. They reportedly are of recent origin, devised by David Wheat (now deceased) in the 1950s.

Stamping Tubes. The ganbo in Haiti, the tok in Korea, the 'au ni mako in Malaitia, entimbo of Uganda, all are bamboo tubes which are stamped on the ground or other surface. Some have holes in the sides for tuning the air column; and some are used in tuned sets.

Indirect Percussion Aerophones. The Vietnamese Dding Pong is a bamboo tube of about three feet in length and two inches in diameter, played by three people. One holds the tube, another claps near one open end, and a third uses prescribed hand movements to open and close the tube at the far end.

Jew's Harps. Many Jew's harps have bamboo lamella; some are idio-lamellar (new term invented just for this occasion), meaning that the entire instrument is a single piece of bamboo, with the tongue slit from the body.

Sansas. Many traditional thumb pianos use springy bamboo for the tongues.

Idiochord Tube Zithers. The fibrous nature of bamboo makes it possible to lift a "string" -- that is, a long, narrow strip of fibrous wood -- from along the stalk, leaving it still attached at the ends. That string can be raised and made taut by tiny sticks slipped underneath at the extremes to act as bridges. It is thus possible to make a many-stringed instrument from a single length of bamboo. Some examples are the Javanese Celempung Bambu, Keteng-Keteng of Sumatra, and the Gintang of India. When several such tube zithers are bound together, the resulting instrument is called a raft zither.

Kite Zithers. There are kites which use bamboo supports with idiochord strings cut from them; they sing in the wind as the kite flies.

Trumpets. The best known lip-buzzed bamboo tube is the Australian didjeridu, although only some of these are bamboo (most are hollowed wood or modern materials). Always traditionally made of bamboo are the Bolivian Tokoro and the (now obsolete) vaccine or boom pipe of Haiti and Jamaica.

Single and Double Reeds. The reeds used in orchestral clarinets and oboes are cut from stalks of Arundo donax, or reed cane. Bamboo has been used for this purpose in various instruments, but is not as effective. There are reed instruments with bodies of bamboo, however, with separate reeds of other materials; and there are also some idioglottal bamboo reed instruments --

Reed Pipes. The pi a of Kampuchea is made of bamboo with a separate double reed. Dding Bbot and Dding Hlom are bamboo clarinets of Vietnam.

Idioglottal Reeds. When the reed of a clarinet or oboe type instrument is carved without separating it from the same piece of material as the body, it is an idioglottal reed. An example in bamboo is the middle eastern Arghul, a double clarinet with five or six finger holes.

Flutes. Bamboo flutes of various forms appear in virtually every culture that knows the use of bamboo.

Panpipes. Panpipes, too, exist in countless cultural environs, and bamboo is one of the materials of choice.

Mouth Organs. The Chinese sheng, the Japanese sho, and numerous Asian relatives, are sets of narrow bamboo tubes rising from a small, hand-held wind chest. The tubes have small free reeds near the base, tuned in agreement with the air column of the tube. A finger hole in the tube deliberately sabotages this agreement, so that with the hole open, the reed will not sound. When the player blows into the wind-chest, only those tubes whose holes are covered will speak.

Plucked String Instruments. Many of the string instruments of India, such as the various forms of Vina, have bamboo bodies (made inconspicuous, perhaps, by the large gourd resonators and frequently very fine overlays and decorative work).

Bowed String Instruments. To Westerners, the natural form of a bowed instrument involves the presence of a fingerboard against which the strings are pressed to alter sounding length. In most of the rest of the world, the standard procedure involves simply exerting finger pressure on the string in midair, which happens to work perfectly well and is actually far more flexible. The neck then usually takes the form of a narrow spike (no fingerboard), and such instruments are accordingly called spike fiddles. Many spike fiddles around the world have bamboo necks.

The Bow Itself. In some early Chinese bowed string instruments, a strip of bamboo was actually used as the horsehair bow is now.

Marimbas. Bamboo can serve two purposes in marimba-type instruments -- it can provide the bars and it can provide the resonators. For bars, a longitudinal section of less than half the tube is usually used rather than the entire cylinder. The tone has all the brightness and more that orchestral xylophones aim for, and, accordingly resonators aren't usually used. The Javanese Calung is an example.

Rattles. Bamboo rattles take many forms. Best known, perhaps, are the Indonesian Anklungs, an elaborately constructed, highly refined instrument which comes in tuned sets.

Another common form is the swisher type (my hastily-invented terminology), in which the end portion of a bamboo stick is slit into many narrow strands like a whisk broom, to produces a sort of percussive swish when the stick is shaken or struck on something. Particularly interesting among these is the Balingbing in

the Philipines, which makes special use of the air column enclosed in the tube to alter the sound, controlling it by means of fingerholes in the side of the tube.

Wind Chimes. What sound in the world is sweeter than bamboo wind chimes?

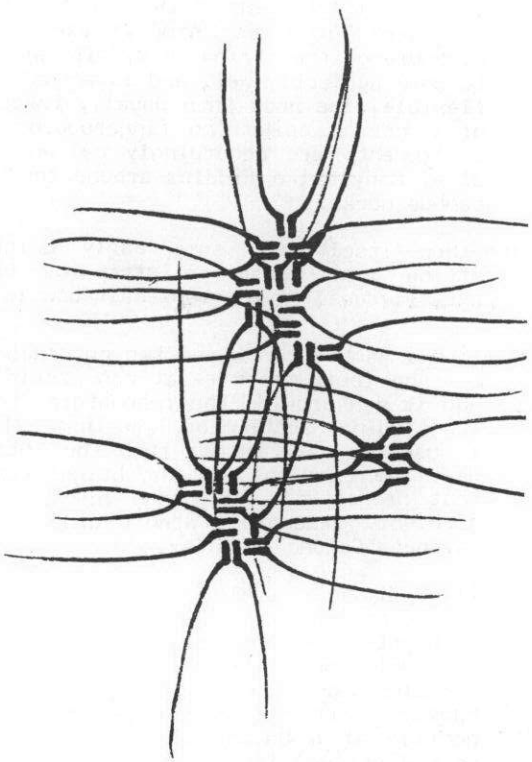
Water Chimes. The Tang Koa of Viet Nam is a wonderfully elaborate, very large scale bamboo chime structure, operated mechanically by the effect of a waterfall on a lever with an open container at one end.

Living Aeolian Pipes. Another Southeast Asian sound device is made from a grove of bamboo. The windward branches are removed and the nodal sections of the windward culms are opened with a chisel or hot tool so as to make a whistle edge tone. With perhaps hundreds of these nodal whistle slits facing the wind the sound has been described as a howling-shrieking-moaning. This device was used as part of a village defence.

Scrapers. Guiro-type instruments are often made of bamboo.

Boos. This is the name Harry Partch gave to his tuned sets of horizontally-mounted short sections of bamboo with dual slits running part of their length, the slits allowing the upper and lower half-tube segments to vibrate opposite one another. Many other builders have since made similar instruments.

Thanks for much of the material above go to the New Grove Dictionary of Musical Instruments, Stanley Sadie, editor.



INSTEAD OF BAMBOO...

There are many plants that share bamboo's cylindrical form and can be used for some of the same purposes, though none compare with bamboo in strength, beauty and versatility. Tony Pizzo reports that seasoned sunflower stalk works well for flutes. He also mentions a "red bamboo" (not truly a bamboo, but somewhat similar in character) which grows wild in the northeast and elsewhere in the U.S. or can be cultivated. When I was young I made flutes with the stalks of various hollow annual weeds the grew and dried of their own accord, unwanted and much disliked, in the area. In another vein, the stalk of the raffia palm is sometimes used, like bamboo, in idiochord zithers (in which a stretched string is created by lifting a length of fiber from the stalk that forms the body of the instrument). However, raffia may not be obtainable outside of the tropics.

Perhaps the most tried and true of alternatives to bamboo is Arundo Donax, better known as reed cane. This is the cane from which single and double reeds for orchestral woodwinds are made, and from which the bodies of the middle eastern Ney flutes, in their various forms, are fashioned. Tony Tammer has provided us with the following information:

Reed cane is grown commercially in France, but it is found in warmer climates in other parts of the world as well. It was imported to the United States because the stalks are useful for bean poles and the like. Being a ready spreader, the plant has since naturalized itself in parts of California and the Southwest. One commercial grower is now raising cane for woodwind reeds in fields near Cloverdale, California. Experimentation continues there regarding approaches to cultivation and curing, and the verdict is not yet in on the quality of the product.

The best cane grows in moist soil in hot climates, preferably in wind-protected areas. It should be at least three years old before being cut; otherwise the moisture content will be too high and it will shrink as it dries. It is best cut in January, when water content is low. To preserve it after it has been cut and fashioned into an instrument, the cane can be dipped in oil (traditionally almond oil) periodically. There are flutes made of reed cane over 100 years ago which remain playable today.

"I wish I could think of a graphic way to express the bamboo's mysterious command of time, how swiftly it grows tall, and stops forever; how, if it blooms, it blooms with the same tidal fervor everywhere at once. For thousands of years in the Orient, bamboo has been of supreme importance to mankind, providing the means of food, materials for building, the substance of countless artifacts, promptings for religious symbolism, the high stuff of art, even the miraculous scaffolding that holds and bends better than steel and is used in the erection of many-storied buildings. What other plant has provided an omnipresent relation between nature and man?"

-- Hildegarde Flanner, in "Bamboo: an Honest Love Affair," in Zyzzyvz Vol. I #2, Summer '85 (55 Sutter St., Suite 400, San Francisco, CA 94104; (415) 387-8389).

BAMBOO IS SOUND MAGIC

By Darrell DeVore

Bamboo is simply the most significant plant on Earth. Its utilitarian purposes are unsurpassed by any living thing. A sacred plant that has always influenced world culture, bamboo has special meaning to the world of music and instrument making. It is a prime source of Sound-Magic (the essential musical voice of any sounding material), giving the world more music and musical possibilities than any other natural material.

Bamboo was playing beautiful music 100 million years before there were humans around to hear it. All this accumulated ancestral Sound-Magic still grows in bamboo stands everywhere, waiting to be heard, to be discovered and shaped into instruments for realizing music.

The pure sound of bamboo goes directly to the center of human spiritual consciousness as a life-affirming signal; distinct, familiar, recognizable, universal.

BAMBOO EXPERIENCE

Eighteen years ago, bamboo planted its roots deep in my consciousness and gradually grew until it changed my life. It became a major voice in a continuing dialogue I've had with music throughout my life. The pursuit of music led me to bamboo. Bamboo led me to instrument making. Instrument making led me to new music . Shaping bamboo became a way to survive economically and spiritually.

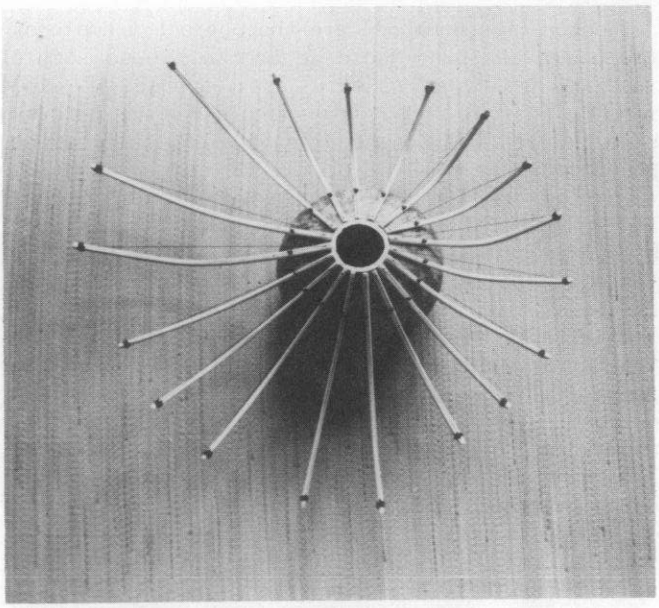
I became a "Fluteman," making, playing and selling bamboo flutes on the streets, on college campuses, in parks, stores, wherever. In a period of a dozen years I made and distributed more than 5,000 flutes to thousands of people. I learned to make several different types: open-end (Ney), slit-end (Shakuhachi), notched-end (Quena), nose flutes, water flutes, membranoflutes, multi-flutes (for multi-players), panpipes, whistles, self-standing, self-playing wind flutes, as well as other aerophones such as trumpets, didjeridus, and saxoboos (bamboo with fingerholes and a saxophone mouthpiece).

Percussion developed parallel to flutemaking. Bootoos (see accompanying article), boobams, a variety of handdrums, shakers, rasping sticks, batutus (tongue idiophones), water percussion, hanging marimbas and windchimes, bull roarers and new outer-air inventions (D-trads, windwands) of bamboo and rubber bands.

New chordophones evolved from ancient musical bows in the form of "Spirit Catchers" (bamboo bows strung with sacred microtonal sound objects and mounted on walls or resonating boxes).

I eventually utilized elements from all these forms to structure environmental sound sculptures for listening and participating, for dance and ritual.

Dealing with that much bamboo... sawing, cutting, splitting, shaving, filing, sanding, burning thousands upon thousands of sound holes, rubbing, polishing, binding ...the repetition of work becomes a ritual. One tries to perfect motions with tools in order to shape bamboo efficiently without harming the magic of the material.



Working with bamboo put me in touch with **shaping spirit** -- the same shaping spirit that helped our ancestors form musical instruments thousands of years ago.

The primitive instrument maker engendered the instrument he made with life, giving it great significance. Such an instrument was approached with reverence because it was capable of music that was necessary to further life.

Bamboo has led me to hear sound phenomena that are new and fresh, beyond human imagination. It is in this bamboo sound phenomena that new music forms will grow and flourish, continuing a tradition of Sound-Magic well into the future.

Top: CIRCULAR CHORDAPHONE. Bamboo bows, nylon strings mounted on a gourd resonator. Strings are beaten with sticks.
Bottom: SELF-PLAYING WIND FLUTES.

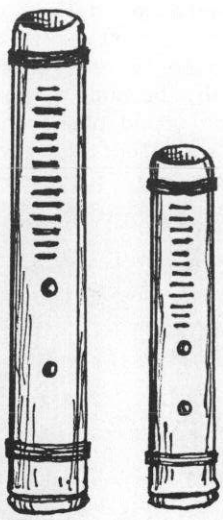
BOOTOO
(Stamped Ideaphones)

Bootoo (Two Bamboos) are the perfect example of the power of Sound-Magic in bamboo. These simple looking primitive objects are capable of wide ranging musical ends, from simple native percussion music to advanced psycho-acoustic sound phenomena.

Bootoo are two bamboo tubes, open at one end and closed the bottom by the node. Two finger holes are burned or drilled in each tube to allow tuning of pitches. (I use only two holes because of the difficulty of gripping the tubes for striking while at the same time independently fingering the tuning holes. This is trickier than it looks.) A row of notches is burned or filed perpendicular to the length and centered directly above the holes to facilitate rasping. The tube ends are rounded by filing and bound by waxed nylon to prevent cracking.

Tuning can be random or in harmonic relationship to the fundamental tone of the tube. It's fairly easy to tune simple triadic scales such as: C, Eb, F, in one tube, and F, Ab, Bb in the other. Disregarding tuning systems, the two fingerholes placed anywhere within a practical zone of balance and finger comfort will produce magical sounds that are musically related. The voice of bamboo sounds good singing any scale.

Bootoos are used in a variety of ways as idiophones (percussion), aerophones (flutes and singing tubes), earphones (listening tubes), and telephones (for long distance calls to ancestors).



BOOTOO

BOOTOO PERCUSSION

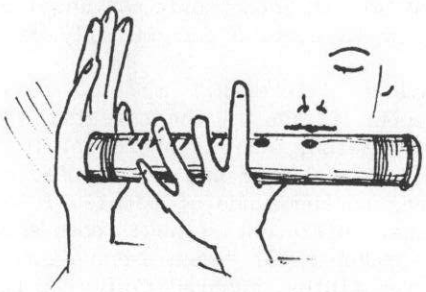
Bootoo are played holding the tubes vertically, open end up, while gripping firmly (not tight) with fingers in position to stop the tone holes. With a downward motion, strike sharply a point on the bottom edge below the closed bottom node against any dense surface (hard ground, concrete, rocks, bricks, tree trunks, kneebones). This will bring out the pure sound of bamboo. Striking both tubes rhythmically while at the same time closing and opening the fingerholes produces a wonderful music of swooping microtonal Sound-Magic. Bootoo can also be played singly by holding a tube in one hand while striking the closed-end edge with a mallet.

Interesting sustained tones can be achieved by slowing drawing the bottoms of the tubes along a rough, hard surface (concrete, asphalt) in a continuous motion.

A multiphonic rasping sound can be made by holding one tube rigid while rubbing the bottom edge of the other tube against the notched grooves of the rigidly held tube in rhythmic patterns.

BOOTOO FLUTES

Bootoo become aerophones when played like a flute. A tube is held horizontally to the mouth with one hand (first finger stopping the hole nearest the open end), while sound is produced by blowing across the open tone hole nearest to the closed end (as in any transverse flute). Working the finger hole produces two distinct tones. Place the palm of the free hand against the open end of the tube and move the palm back and forth while sounding the flute tone. This action creates a wide variable pitch-range of the sound coming from the open tube end. Two or more Bootoo sounded together in this manner create magical new music.



BOOTOO FLUTE

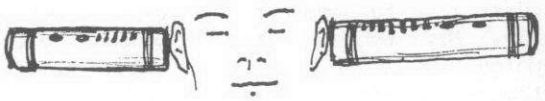
SINGING TUBES

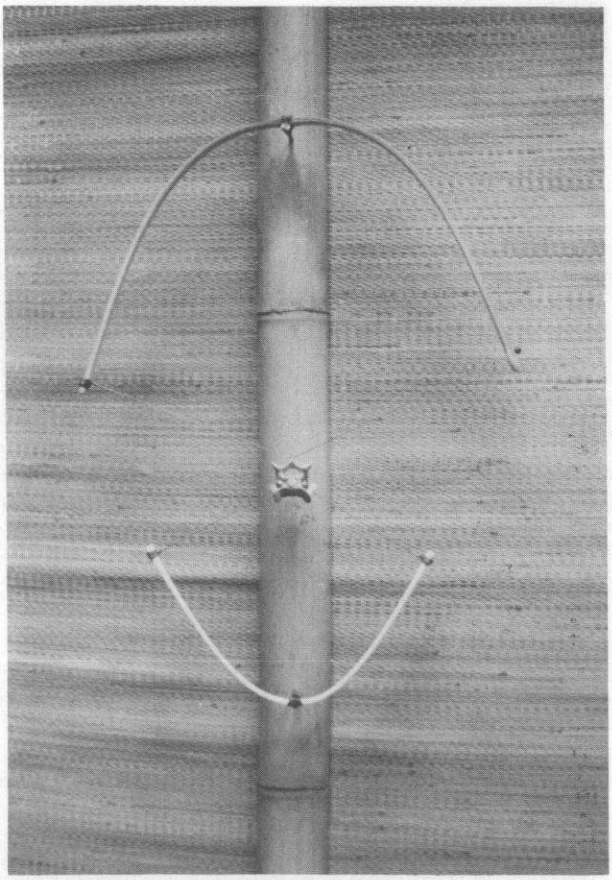
Place the open and of Bootoo so it completely covers your mouth and sing into it while manipulating the finger holes for some very unusual vocal effects.

BOOTOO AS LISTENING TUBES (Bamboo Walkman)

One of the most delightful and surprising sound experiences occurred when I first put the open ends of a pair of Bootoo snugly to my ears and rhythmically closed and opened the two finger holes of each while listening to external sound sources. My ears were amazed. I was hearing other-worldly music bouncing and echoing off the walls of the inner chamber of bamboo. Each time I lifted a finger, opening the hole, all perceivable external sounds rushed into the chamber, along with a complex of wind voices stacked upon the tonal frequency of the bamboo interior fundamental. Precise coordination of left and right handed finger stopping resulted in mind-boggling stereo psycho-acoustical effects. Instant new music.

It is an especially powerful experience to listen to and play these tubes with live acoustic instruments and live singing voices, including your own. Recorded music, industrial noise, bird songs, any sounds are transformed by this process into an infra new music form that only you can hear, and that cannot be reproduced. Bootoo may be the first bamboo personal stereo system.



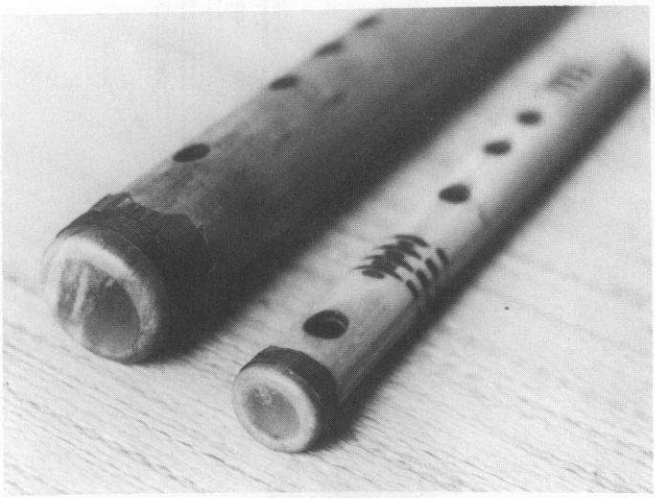


Two more bamboo instruments by Darrell DeVore --
Above: BAMBOW, a spirit catcher of bamboo, nylon & bone.
Below: MEMBRANOFLUTES, made of bamboo & goatskin.

I have enjoyed much music with these instruments over the years. I came upon this design about fifteen years ago as an evolutionary offshoot of my bamboo flutemaking. I have composed and performed with tuned sets of Bootoo that resulted in music probably very similar to the Haitian Ganbo music (described by Bart Hopkin in EMI Vol. III #2) and other bamboo music of the world.

The beauty of Bootoo is in their simplicity and versatility. They can be made easily with few tools from any size available bamboo.

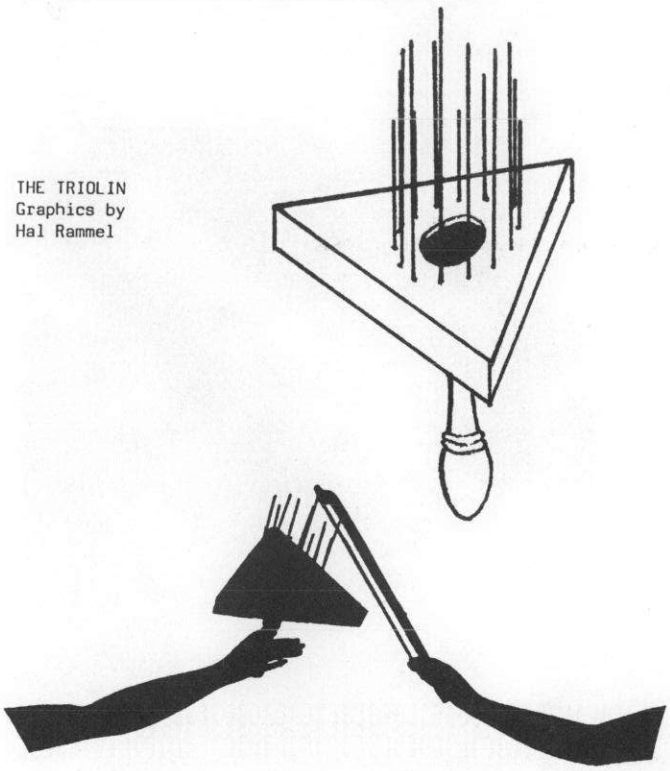
Instruments like Bootoo embody the essence of a Sound-Magic that comes from ancient times to enlighten and instruct the present. A primitive tradition of new music is passed on to the future, as contemporary musicians and instrument makers continue to explore the many sounds of bamboo. There is a belief among some primitive people that spirits live in the inner chambers of bamboo. Listening to Bootoo, that is clearly true.



INSTRUMENTS

THE TRIOLIN
Designed and built by Hal Rammel
Article by Hal Rammel

The triolin is a three-sided hybridization of the nail violin and the waterphone, sans nails, sans water. It, in fact, originated a few years ago as a nail violin gone awry. Built from found materials, the triangular wooden resonator, holding a circular arrangement of perpendicular metal rods, has, in the center of the bottom triangle, a wooden handle for rapid spinning or reciprocating motion of the instrument against a bow. While a circular resonator might facilitate this bowing technique, the visual effect of a spinning equilateral triangle is an essential part of the triolin performance. The length of each metal rod is arbitrary and their arrangement staggered in a wide variety of intervals. Thus, the tuning is largely untamed, in the spirit of an automatist approach to music making, promoting the spontaneous discovery of unforeseen and unpredictable phrases and harmonies. Metal rods loosely inserted into a wooden resonator, while lacking the ethereal sounds of the all metal waterphone, have unique tonal qualities ranging from wistful to callathumpian. In slower passages the triolin evokes the violin virtuosity of Little Lulu. With rapid "jiggy bowing" the sound, although quite familiar to the ears and imaginations of Inuit fiddlers and their audience, reflects an intransigence underrated in the Western classical tradition. With the triolin, like other tools for exploration of the sonic pluriverse, design and construction are only the beginning.



THE TRIOLIN
Graphics by
Hal Rammel

ORGANIZATIONS AND PERIODICALS

GLASS MUSIC INTERNATIONAL

Over the last eighteen months a new organization has come into being in the world of unusual instruments. Glass Music International was founded in 1986 by Norman L. Rehme, a maker and player of the glass harp (musical glasses) in Colorado. The organization's purpose is to promote glass music in all its forms. Since its formation it has grown to sixty-plus members in several countries, established a newsletter, and initiated plans for various activities and events.

The newsletter is **Glass Music World.** It is scheduled to appear quarterly; the second issue, which has grown to six pages (the first was a single two-sided sheet) came out in October 1987. Plans have been made for an extended version to appear once a year, in a form akin to a scholarly journal.

Focus in the newsletter thus far has been on the various forms of musical glasses -- Franklin-style glass harmonicas, and sets of individual glasses mounted upright on a board, pre-tuned or tuned by water. The matter of developing a consistent nomenclature for instruments of this type has given rise to some exchange in the newsletter already. Mr. Rehme writes a column entitled "Technical Topics," which has dealt with some additional interesting subjects. One is the question of the configuration of pitches on sets of upright glasses, for which no standard exists. Another has been mounting systems for attaching glasses to the board, and a third has been basics of tuning individual glasses by grinding. Another regular feature in the newsletter has been "Introductions Please," a column which profiles individuals in the membership.

Glass Music International is also establishing a library to hold glass music scores and make them available to the membership. Under the curatorship of Ken Petrowski a starting collection has been gathered and catalogued; it continues to grow.

One of the most exciting things Glass Music International has in the plans is a glass music conference and festival, to be held at the Corning Museum of Glass in Corning, NY, October 10-14, 1988. The specific itinerary for the festival has not yet been set, and the organization is interested in input from members on that subject.

Membership in Glass Music International is $15/year for sustaining members and $40/year for president's members (which includes library privileges). Higher echelons of membership are also available. For more information contact Glass Music International, Inc., 2503 Logan Dr., Loveland, CO 80538.

BOOKS

Continuing EMI's series on musical instrument exhibit catalogues...

CATALOGUE FOR THE EXHIBITION/FESTIVAL
FOR NEW INSTRUMENTAL RESOURCES I & II
Co-sponsored by University of California at San Diego's Center for Music Experiment and Interval Foundation

40 page catalog, bound into the Spring-Summer 1980 issue of **Interval** Magazine. Still available, but in limited quantities, from Interval Foundation, Box 8027, San Diego, CA 92102.

Contributors to the festivals whose work or words appear in the catalog include: Robert Erickson, David Hatt, Paul Dresher, Burt Turetzky, Richard Dunlap, Bob Wilhite, Jeff Pressing, Jonathan Glasier, Prent Rodgers, Danlee Mitchell, Brad Dow, John Silber, Jean-Charles Francois, Scott Hackleman, George Secor, Michael Udow, Pauline Oliveros, John Forkner, Will Parsons, Grace Bell, Del Roper, Arthur Frick, Paul W. Simons, David Dunn, and John Gibbon.

The Exhibit/Festival for New Instrumental Resources is a recurring event devoted to new musical sound sources. The festivals began, sponsored by Interval Foundation and other co-sponsors, in 1979. They've occurred at irregular intervals since, and may continue in the future. Presented at the festivals have been displays of instruments, lectures and demonstrations, concerts and more free-wheeling music-making situations, panel discussions and informal discussions, amid an always interesting cast of characters. The nominal emphasis on instrumental resources has served as a starting point more than a legal description. In keeping with Interval Foundation's wide interests, the events and discussions have often addressed broad questions concerning how we make music and hear it.

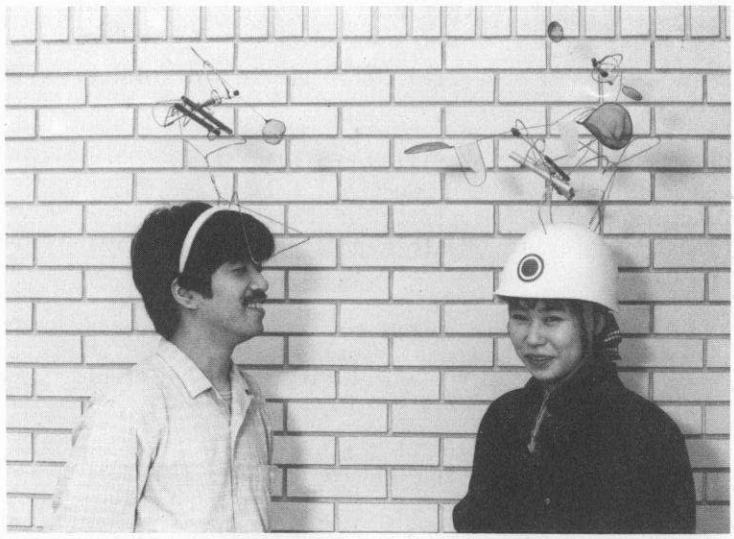
This catalog documents the first two Exhibit/Festivals, which took place in San Diego in May of 1979 and 1980. It was produced after the events had taken place, allowing it, unlike most exhibit catalogs, to go beyond itinerary and report on actual happenings. The catalog opens with a short introduction providing overviews of the events of the two festivals. Following that are writings and photographs devoted to the work of each of the many contributors. Some of these texts were written by the artists themselves; some were not. Mixed in with the artists' pages are transcriptions of panel discussions. Also included are some excerpts from the writings of Harry Partch.

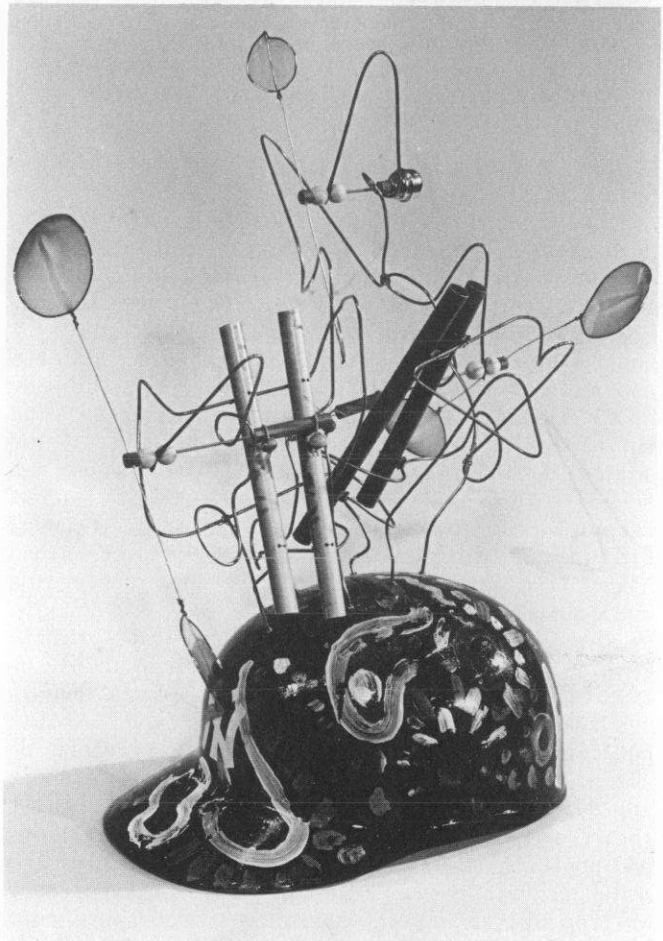
To enjoy this document, you will have to put on your hip boots and wade in -- get what's worth getting without worrying about the niceties. The graphic reproduction of the catalog is not always the best, making the photographs at times difficult to decipher. The layout is occasionally confusing, and it is sometimes difficult to find one's way through the forest of people, instruments and ideas represented.

But there is a great deal to be found here, being as it is the product of a place and time in which an awful lot of provocative thought and activity was taking place. Most interesting is the mix of people appearing in these pages. Some of them may no longer be active in instrument design; some are now more involved in other aspects of music making; many still are designing and building. Many (as a glance at the list of participants above shows) have continued as prominent names in contemporary music. What comes across in the catalog is that they constituted a very interesting and diverse bunch, and they had a lot to say at the time these festivals took place.

From that point of view, the most interesting portions of the catalog are the transcriptions of the five panel discussions. The topics covered are "New instrumental Resources -- What are the Implications for the Present and Future?", "Found Objects Panel," "Percussion Panel," "Microtonality," and "New Instrumental Resources, Now What?" Once again, hip boots are required. Informal speech, we all know, tends to appear incoherent upon the printed page. But some extraordinarily insightful observations, challenging ideas and questions are scattered among the open-ended discussions transcribed here. Especially interesting are the ruminations -- which crop up in several of the panels -- on that ambiguous territory between pitch and timbre, and the question of what becomes of our notions of melody, harmony and scale when we look at the frequency components of music in a truly elemental fashion. Panelists also frequently come back to the question of how to get people to hear music in new ways.

For people interested in seeing comprehensive depictions of the new and unusual instruments which appeared in the festivals -- and there were many such instruments -- this catalog will not be entirely satisfying. That seemingly is not its purpose. Discussions of the instruments themselves are for the most part brief and not explicit. But like other exhibition catalogs we have reviewed in this column, it does provide some documentation in a field that often sees none.





TINKOLOLIN ON THE HEAD

Above and right are photographs of sound helmets, called "Tinkololin on the Head," created by Leo Tadagawa. Mounted on a helmet or a plastic hairband are ornate superstructures which include aluminum tubes and propeller-like assemblies. When the person wearing this headgear walks, the movement of the propellers causes small beads to strike the tubes, and the sound is communicated to the wearer for a special sort of personal stereo.

The photograph directly above shows "Tinkololin on the Head" in conjunction with the huge serpents called "Orochi," made by Takayuki Kakizaki.

Both of these instrument types appeared in the Sound Garden exhibit in Tokyo featured in EMI Vol. III #2.

NOTICES

"THE BUG" - a Portable Electroacoustic Percussion Board. You can have a whole percussion orchestra at your fingertips in the space of only two square feet! The Bug, with its assortment of rods, nails, combs, springs and strings, will delight your ear and amaze your friends and fellow musicians. Almost any contact mic and amplification system may be used. The price for direct orders is $150.00 plus shipping. To order, write Tom Nunn, 3016 25th St., San Francisco, CA 94110, or call (415) 282-1562.

ZOUNDS! -- A NEW SONIC ARTS GALLERY has opened in downtown San Diego under the auspices of Interval Foundation, at 612 F Street near 6th Ave. Instruments and sound sculpture by Harry Partch, Arthur Frick, Ivor Darreg, Tom Nunn and Jonathan Glasier are featured. For more information contact Interval Foundation at Box 8027, San Diego, CA 92102.

MANY BACK ISSUES OF **EXPERIMENTAL MUSICAL INSTRUMENTS** have sold out in their initial printing. They remain available in photocopy at a reduced price of $2.50 per single issue or $14 per volume set. (All six issues of the Vol. I set and half of those of the Vol. II set are in photocopy; the rest are first run.) The photocopy issues have reasonably good reproduction quality and come in a protective cover. Volume II #4 and later issues remain available in their original form at the regular single copy price of $3.50. All from **Experimental Musical Instruments**, PO Box 784, Nicasio, CA 94946.

CASSETTE TAPES FROM EMI: **From the Pages of EMI** Volume I is a 45 minute cassette featuring the music of instruments that appeared in EMI during its first year of publication. Its successor, **From the Pages of EMI** Volume II, is a 60 minute cassette with music from EMI's second year. Each contains a full measure of odd, provocative, beautiful, funny, and lively music. The cost is $6 apiece for subscribers; $8.50 for non-subscribers, from **Experimental Musical Instruments** PO Box 784, Nicasio, CA 94946.

RECENT ARTICLES continued from page 20

background that led to the freedom to break tradition, but a photograph shows a wonderfully odd, yet coherent and balanced-looking instrument.

REPAIRING THE SITAR, by Dave Schneider, describes problems that commonly arise in sitars, and the solutions that the author has devised. As a side effect of that information we also get a sense of how the instrument is put together.

THE SCALLOPED FRETBOARD, also by Dave Schneider, looks at a special approach to fretboard design, in which the wood in the spaces between the frets is carved out to create a curved indentation. The advantage of this is that the hollowed space there allows the player greater flexibility in bending strings, in a manner reminiscent of high-fretted Indian instruments.

RECENT ARTICLES APPEARING IN OTHER PERIODICALS

Listed below are selected articles of potential interest to readers of **Experimental Musical Instruments** which have appeared recently in other publications.

TOM GURALNICK, interviewed by Manuel Rettinger in **Artspace** Vol. II #4, Fall 1987 (2227 Lead SE, Albuquerque, NM 87106).

Tom Guralnick is a reed player who works with a reedman's equivalent to the percussionist's rack, which he calls "The Mobile Saxophone and Mute Unit." It holds a number of conventional and unconventional wind instrument sound sources, plus a complement of peculiar mutes, all within easy reach for a single performer. The interview doesn't go into details on the rack but discusses Guralnick's composition and performance work in a general manner. Included with the issue is a soundsheet with a sample of the music.

GREAT MOMENTS IN PHYSICS, Gordon Monahan interviewed by Mark Weber in **Option** Q2, Nov/Dec 1987 (2345 Westwood Blvd., Suite 2, Los Angeles, CA 90064).

In this interview Monahan talks about, among other things, two of his recent acoustic exploration performance pieces. In the most recent, **Speaker Swinging**, Monahan sends electronic sine wave signals to speakers which the performers swing over their heads on tethers. In the earlier **Piano Mechanics** he explores some of the outlying sonic possibilites of a grand piano.

DISCOGRAPHY OF MICROTONAL MUSIC, CASSETTOGRAPHY OF MICROTONAL MUSIC, and BIBLIOGRAPHY OF MICROTONAL MUSIC, compiled by Johhny Reinhard in **Pitch** Volume I #2, Summer 1987 (c/o Johnny Reinhard, 211 West 108th St., #42, New York, NY 10025).

In addition to serving their primary purpose of listing available microtonal materials, these Ographies contain (not surprisingly) references to a good many instrument explorations.

The most recent **Luthier's Mercantile Catalog for Stringed Instrument Makers**, not dated (PO Box 774, 412 Moore Lane, Healdsburg, CA 95448).

The main purpose of this catalog, of course, is to list and describe items that Luthier's Mercantile sells, but also appearing are quite a few valuable writings. Many deal with woods and woodwork with an eye specifically to instrument making; also included are one on "Graphite-Epoxy Composites," another called "Fine Oil Finishes for the Instrument Builder," and one from Irving Sloane entitled "Thoughts on Tool Design."

HARPMAKER'S NOTEBOOK #6, by Mark Emery Bolles in **Folk Harp Journal** #58, Fall 1987 (for back issues: Robinson's Harp Shop, PO Box 161, Mt. Laguna, CA 92048-0161).

Mark Bolles continues his discussions of strings and their physical properties, and the interaction of the several factors of length, mass, tension and tensile strength.

BIRTH AND DEATH OF ONE MORE HARP DESIGN: THE JOHNSOPHONE, by Gordon Johnson, also in **FHJ** #56 (see above).

A firsthand account of an inexperienced harper's discoveries in designing a harp from scratch. Rather than opening up new horizons, this experience led the builder to a heightened appreciation of traditional designs for diatonic harps. At the same time, he did hit upon some worthwhile new design ideas.

Several interesting articles appear in **Percussive Notes** Research Edition, Volume 25 #3, March 1987 (214 West Main St., Box 697, Urbana, IL, 61801-0697):

AN INTERVIEW WITH ROBERT ERICKSON, conducted by Daniel C. Dunbar, explores many facets of Erickson's work. Erickson has explored various acoustic sound sources, with and emphasis on tube drums and tuned stroked rods, as well as lithophones in the form of a travertine marble bar instrument. These and others are discussed, and photos are included.

In THE MAKING OF BRONZE MUSICAL INSTRUMENTS IN INDONESIA, EMI contributor Pierre-Jean Croset (through translator Justice Olsson) describes the manufacture of bronze bars and gongs for gamelan instruments. From the obtaining of raw materials, through smelting, hammering and scraping processes, to the final tuning procedures, the article provides enough detail to illucidate the traditional technologies.

A NEW SYSTEM FOR QUARTERTONE PERCUSSION, by James Wood, presents ideas on adapting existing percussion instruments, particularly resonated bar instruments, for quartertone scales. Since complete quarter tone scales over the full range create some logistical problems, the author suggests limited scales, and diagrams some possible layouts.

American Lutherie #11, Fall 1987 (8222 S Park Ave, Tacoma, WA 98408) once again has a wealth of noteworthy material in this issue, with several articles appearing under a special heading of "Non-traditional Aesthetics":

DEVELOPING A NEW DESIGN, by Steve Klein, is a transcription of a lecture given at the Guild of American Luthiers' 1986 convention. In it Klein discusses ways in which he has departed from traditional design in his guitar building. He also considers problems that unconventional instruments may encounter in the marketplace.

MARVELS AMONG THE REEDS, by Susan Norris, presents a violin in altered form, with five playing strings, several more synpathetic strings, and an asymmetrical shape. The design is not described in this short article as much as the

(Continued on page 19)